What is claimed is:

1. A fuel cell, comprising:

a substrate; and

a film deposited on the substrate, the film having a plurality of nanowires therein;

wherein the plurality of nanowires enhances catalytic activity and conductivity of the film.

2. The fuel cell as defined in claim 1 wherein the plurality of nanowires increases the number of sites per unit volume where catalysis takes place.

3. The fuel cell as defined in claim 1 wherein the substrate is an electrolyte.

4. The fuel cell as defined in claim 3 wherein the electrolyte is at least one of oxygen ion conducting membranes, proton conductors, carbonate (CO_3^{2-}) conductors, OH^- conductors, cubic fluorite structures, doped cubic fluorites, proton-exchange polymers, proton-exchange ceramics, yttria-stabilized zirconia, samarium doped-ceria, gadolinium doped-ceria, $La_aSr_bGa_cMg_dO_{3-\delta}$, and mixtures thereof.

5. The fuel cell as defined in claim 1 wherein the substrate is at least one of single crystal silicon, polycrystalline silicon, silicon oxide containing dielectric substrates, alumina, sapphire, ceramics, cermets, anode materials, cathode materials, current collector materials, and mixtures thereof.

6. The fuel cell as defined in claim 1 wherein the plurality of nanowires is formed from at least one of carbon, copper, nickel, platinum, gold, iron, alloys thereof, stainless steel, lanthanum strontium chromite, current collector materials, electrode materials, catalyst materials, electrolyte filament materials, and mixtures thereof.

7. The fuel cell as defined in claim 6 wherein the current collector material comprises high temperature metals.

8. The fuel cell as defined in claim 7 wherein the high temperature metals are at least one of gold, copper, stainless steel, nickel alloys, and mixtures thereof.

9. The fuel cell as defined in claim 1 wherein the film comprises an anode.

10. The fuel cell as defined in claim 9 wherein the plurality of nanowires comprises metallic components of anode material.

11. The fuel cell as defined in claim 10 wherein the anode metallic components comprise at least one of nickel-copper alloys, platinum, palladium, ruthenium, alloys thereof, and mixtures thereof.

12. The fuel cell as defined in claim 1 wherein the film comprises a cathode.

13. The fuel cell as defined in claim 12 wherein the plurality of nanowires comprises metallic components of cathode material.

14. The fuel cell as defined in claim 13 wherein the cathode metallic components comprise at least one of rhodium, platinum, silver, alloys thereof, and mixtures thereof.

15. The fuel cell as defined in claim 1 wherein the plurality of nanowires is randomly oriented throughout the film.

16. The fuel cell as defined in claim 1 wherein the plurality of nanowires has a diameter ranging between about 1 nm and about 100 nm.

17. The fuel cell as defined in claim 1 wherein the plurality of nanowires has a diameter ranging between about 10 nm and about 50 nm.

18. The fuel cell as defined in claim 1 wherein the plurality of nanowires has a length ranging between about 15 nm and about 2000 nm.

19. The fuel cell as defined in claim 1 wherein the plurality of nanowires has a length ranging between about 100 nm and about 500 nm.

20. An electronic device, comprising:
a load; and
the fuel cell of claim 1 connected to the load.

21. A method of making a film, comprising the steps of:
dispersing a plurality of nanowires in a liquid;
depositing the liquid having the nanowires therein on a substrate; and
heating the substrate, the substrate having the liquid deposited thereon.

22. A film produced by the process of claim 21.

23. The method as defined in claim 21 wherein the liquid comprises at least one of organometallic solutions, sacrificial polymeric solutions, photoresists, and solvents.

24. The method as defined in claim 23 wherein the organometallic solution is at least one of sol-gels, metal-organometallic compounds suspended in solution, metal ions coordinated with organic ligands dissolved in solution, and mixtures thereof.

25. The method as defined in claim 21 wherein the substrate is an electrolyte.

26. The method as defined in claim 25 wherein the electrolyte is at least one of oxygen ion conducting membranes, proton conductors, carbonate (CO_3^{2-}) conductors, OH^- conductors, cubic fluorite structures, doped cubic fluorites, proton-exchange polymers, proton-exchange ceramics, yttria-stabilized zirconia, samarium doped-ceria, gadolinium doped-ceria, $La_aSr_bGa_cMg_dO_{3-\delta}$, and mixtures thereof.

27. The method as defined in claim 21 wherein the substrate is at least one of single crystal silicon, polycrystalline silicon, silicon oxide containing dielectric substrates, alumina, sapphire, ceramics, cermets, anode materials, cathode materials, current collector materials, and mixtures thereof.

28. The method as defined in claim 21 wherein the plurality of nanowires is formed from at least one of current collector materials, electrode materials, catalyst materials, electrolyte filament materials, and mixtures thereof.

29. The method as defined in claim 28 wherein the current collector material comprises high temperature metals.

30. The method as defined in claim 29 wherein the high temperature metals are at least one of gold, copper, stainless steel, nickel alloys, and mixtures thereof.

31. The method as defined in claim 28 wherein the plurality of nanowires comprises metallic components of anode material.

32. The method as defined in claim 31 wherein the anode metallic components comprise at least one of nickel-copper alloys, platinum, palladium, ruthenium, alloys thereof, and mixtures thereof.

33. The method as defined in claim 28 wherein the plurality of nanowires comprises metallic components of cathode material.

34. The method as defined in claim 33 wherein the cathode metallic components comprise at least one of rhodium, platinum, silver, alloys thereof, and mixtures thereof.

35. The method as defined in claim 21 wherein the dispersing step randomly orients the plurality of nanowires, thereby forming a homogeneous suspension.

36. The method as defined in claim 35 wherein the dispersing step is accomplished by sonicating the plurality of nanowires in the liquid.

37. The method as defined in claim 35, further comprising the step of:

controlling the random orientation of the plurality of nanowires, thereby modifying the electronic states to enhance catalytic activity.

38. The method as defined in claim 21 wherein the depositing step is accomplished by at least one of electrodeposition, spin coating, dip coating, and squeegee coating.

39. The method as defined in claim 21 wherein the liquid is a photoresist material.

40. The method as defined in claim 39 wherein the photoresist is at least one of tetra-ethylene glycol diacrylate, poly(4-vinylphenol), poly(4-hydroxystyrene, polyvinylphenol (PVP), DNQ (diazonaphthoquinone)-novolaks, and mixtures thereof.

41. The method as defined in claim 40 further comprising the steps of:

selectively imaging the photoresist, the photoresist having the plurality of nanowires dispersed therein; and

processing any non-imaged photoresist in a manner sufficient to render deposition of nanowires without the photoresist.

42. The method of claim 41 wherein imaging is accomplished by exposing the photoresist to a light source.

43. The method as defined in claim 21 wherein the heating step comprises:

baking the substrate with the liquid deposited thereon, thereby removing solvents; and then

annealing to drive off organic materials and to form a predetermined crystal phase.

44. The method as defined in claim 43 wherein the bake temperature ranges between about 100°C and about 450°C.

45. The method as defined in claim 43 wherein the bake temperature is about 200°C.

46. The method as defined in claim 43 wherein annealing is accomplished at a temperature ranging between about 450°C and about 800°C.

47. The method as defined in claim 43 wherein annealing is accomplished at a temperature ranging between about 650°C and about 1050°C.

48. A method of using a fuel cell, comprising the step of:

operatively connecting the fuel cell to at least one of an electrical load and an electrical storage device, the fuel cell comprising:

a substrate; and

a film deposited on the substrate, the film having a plurality of nanowires therein;

wherein the plurality of nanowires enhances catalytic activity and conductivity of the film.

49. A fuel cell, comprising:

a substrate;

a film deposited on the substrate; and

means for substantially enhancing catalytic activity and conductivity throughout the film.

50. A film, comprising:

an electrode; and

a plurality of nanowires disposed within the electrode;

wherein the plurality of nanowires enhances catalytic activity and conductivity of the film.

51. The film as defined in claim 50 wherein the plurality of nanowires are formed from at least one of current collector materials, electrode materials, catalyst materials, electrolyte filament materials, and mixtures thereof.

52. The film as defined in claim 51 wherein the current collector material comprises high temperature metals.

53. The film as defined in claim 52 wherein the high temperature metals are at least one of gold, copper, stainless steel, nickel alloys, and mixtures thereof.

54. The film as defined in claim 50 wherein the electrode is an anode.

55. The film as defined in claim 54 wherein the plurality of nanowires comprises metallic components of anode material.

56. The film as defined in claim 55 wherein the anode metallic components comprise at least one of nickel-copper alloys, platinum, palladium, ruthenium, alloys thereof, and mixtures thereof.

57. The film as defined in claim 50 wherein the electrode is a cathode.

58. The film as defined in claim 57 wherein the plurality of nanowires comprises metallic components of cathode material.

59. The film as defined in claim 58 wherein the cathode metallic components comprise at least one of rhodium, platinum, silver, alloys thereof, and mixtures thereof.

60. The film as defined in claim 50 wherein the plurality of nanowires is randomly oriented throughout the film.

61. The film as defined in claim 50 wherein the plurality of nanowires has a diameter ranging between about 1 nm and about 100 nm.

62. The film as defined in claim 50 wherein the plurality of nanowires has a diameter ranging between about 10 nm and about 50 nm.

63. The film as defined in claim 50 wherein the plurality of nanowires has a length ranging between about 15 nm and about 2000 nm.

64. The film as defined in claim 50 wherein the plurality of nanowires has a length ranging between about 100 nm and about 500 nm.